Telemedicine for AIDS Patients Accommodations

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Abstract

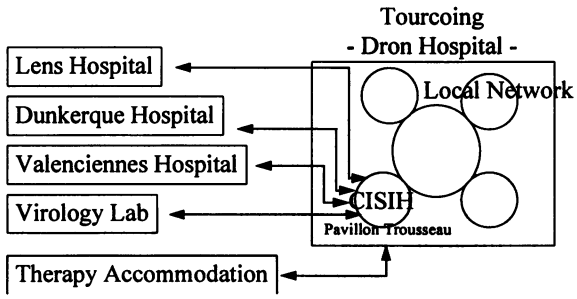
People suffering from AIDS are subject to frequent hospitalisations. In some cases, they cannot go back home after hospitalisations, due to severe illness, family or sociologic problems. This is the reason why some therapeutic flats are at their disposal to make easier their medical follow-up after the hospital's discharge. In these Therapy Accommodation, they are treated by trained GP who often suffer from lack of information and lack of expertise in difficult cases. For this purpose, we included these flats in the regional Telemedicine AIDS network to give these physicians free access to the computerised multimedia medical record of their patients and to provide them with synchronous co-operation facilities.

Introduction

The AIDS epidemic is changing with the stabilisation of the number of infected patients and the lengthening of their duration of life due to better and more effective treatments. Consequently, each patient is passing through many episodes of acute disorders leading to hospitalisations, followed by convalescence periods. When convalescent, the patient is rarely able to have a normal life and needs appropriate treatments and cares. With this purpose, some therapy flats were organised and placed at the patients' disposal. In these therapy flats, the patient can stay till eight months, and is carefully followed by the General Practitioner of the sector. But these GPs are complaining of a lack of information from the hospital at the patient's discharge. This is why we have developed a Telemedicine application for a better co-ordination between the GP in the therapy flat, and the hospital.

Methods

Since 1992 [1], we have developed a regional healthcare network (Region Nord-Pas de Calais in France), including the 5 largest hospitals, to take charge of the VIH Infected patients.



Telemedicine applications were designed to support this network providing the hospital specialists with:

- A multimedia medical record allowing the collection of medical and biological data, images, therapy follow-up.
- Asynchronous communication facilities including the transmission of the medical dossiers, the transfer of images and all the electronic mail capabilities.
- Synchronous communication facilities including telediagnosis and teleconferencing to solve difficult problems in the diagnosis, the treatment protocols or the follow-up of these patients.

This effective program was adapted to the therapy flats, so that the GP can have at disposal all the relevant information from the hospital medical record, as soon as possible. A multimedia computer is installed in the therapy flat. This station is connected with the hospital network through ISDN. When connected, the GP can consult the hospital patient record, the last biological or radiological results, the treatment protocols and the discharge letter. He can ask for complementary information by two ways:

- remote tele-expertise if a specialist is available
- electronic mail on the contrary

Although computers are familiar in medicine, they have generally not been exploited to assist people working together. The applications are, for the most part, "single-user" systems. By means of multimedia applications and the use of modern networks, new types of collaboration between distant physicians will become possible, introducing the concepts of Computer-Supported Co-operative Work in Medicine.

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A Multimedia workstation for medical records:

The medical Record

We defined a multimedia workstation allowing the management of medical records able to include and treat multimedia information. The structured medical record is divided in three parts:

Part I:

- Identification
- Allergies and vaccines
- Emergency data
- Medical History

Part II: The Current record

- Hospitalisation Motive
- Medical information (clinical examination, diagnosis)
- Treatments

Part III:

- Summary and Conclusion of the record

Multimedia documents can be linked with the record.

- Images: some images are directly obtained from the acquisition devices (Nuclear Medicine, CT-Scans, NMR) through the hospital network On the contrary, the images are actually digitalized using a 3CCD. To capture, compress, and store images, we use the DVI technology (Intel). The most frequent format used to display images is 512x512 pixels. High-resolution TV is necessary to give good results to the physician. These images are always accompanied by the radiologist's report.

- Free Texts for letters or images interpretation: These documents are created using word processing software for letters, discharge summaries, surgical or radiological reports.

- Laboratory results and summaries with the possibility of visualising trends in different periods of time. Specialised spreadsheets provide this service with graphic presentations of the results.

- Oral messages: In certain cases, physicians have to exchange messages concerning the patient without writing letters or structured data files. Using the DVI technology, it is possible to register the voice of the physician and to store it under the form of a file. The oral messages can be linked with other documents as letters, texts, or images. They eventually contain non-medical information, intended for any colleague. This oral message may also be a quick interpretation of examinations or a rapid report of an emergency image.

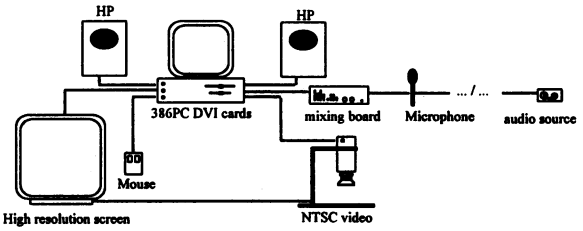
This workstation was realised using PC 486 micro-computers. They are equipped with digitalisation (DVI) cards and software for the compression decompression of the images and storage facilities. The capture of images is performed through digitalisation process using video JVC camera. They are displayed on high-resolution SONY TV screens. Their manipulation uses DVI software facilities . Oral messages or sounds are digitalized and stored by means of microphones and audio station.

To improve the management of the medical multimedia data, we designed original friendly interfaces for the handling of the different types of records (texts, sounds, images). Zooming, multi-images presentation are also possible as an hypermedia [2].

The Co-operative work for Telemedicine

When a multimedia medical data set is stored on a micro-computer, it is possible to select the entire record and send it towards the hospital or the physician who needs the information. The transfer of complex data structures is easier by means of ISDN Networks (NUMERIS in France) where images, records, phone calls can be transmitted at a very low cost price.

The connection is performed by means of specialised telecommunication boards implemented in the PC. Protocols of communication are easily automated to make them as comfortable and friendly-use as possible. The transmission of a record containing the minimal medical data set, 8 images and 2 short oral messages takes only one minute. So, the record of a patient could it destination before the patient himself is in the ambulance ! The cost price of such a mailing is less than 5 FF (One US Dollar). This is cheaper than stamps.



The Multimedia Workstation

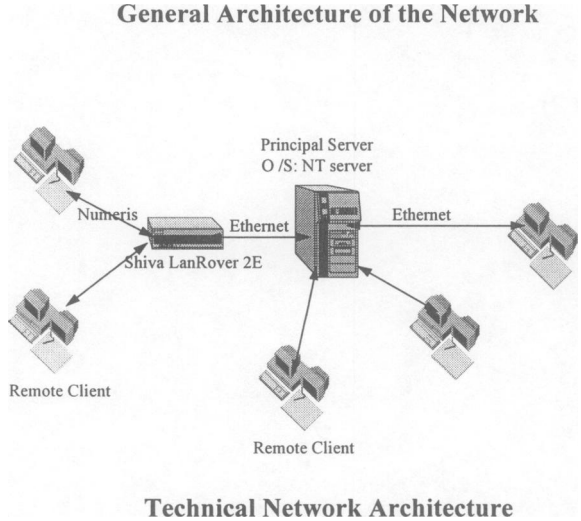
Towards an effective distant collaboration between physicians.

The ISDN networks provide users with renewed possibilities. The speed of transmission allows rapid exchanges of data (such as medical records as described above). And we can also use this network for synchronous co-operation to exchange and to work on the same documents utilising the facilities provided by the networks following the « White Board » paradigm [3,4].

A current example is the co-operation between a specialist and the family doctor: a General Practitioner (GP) asks the specialist for complementary information concerning a patient's medical record and his therapy protocol. Using the « White Board » facilities including the presentation of several documents, the use of a tele-pointer, the two specialist can discuss the medical record as in the following scenario:

1. The GP phones the specialist and asks for complementary information.
2. The specialist and the GP connect their micro-computer on the network and make the connection effective for real-time synchronous data exchanges.
3. The specialist (or the GP) sends the document to his correspondent.
4. The specialist, using the mouse, can give explanations about a medical image, showing the abnormalities of the scan and circling pathologic damages. When he clicks on the left button of the mouse, he is the "master"; when he clicks on the right button of the same mouse, the correspondent becomes the master and can show his own regions of interest on the same image. They can also discuss the therapy protocol and modify it if necessary.
5. During all the phases of this new type of conversation, the two physicians are in contact through the phone. Numeris provides two 64 Kbits channels: one can be used for the phone, the other for sending images and the tele-pointer co-ordinates.

Security and confidentiality of the data can be ensured by ciphering methods. These methods are just nowadays authorised in France. So the medical dossiers can be safely exchanged between physicians. We are currently studying smart cards capabilities to improve the security of these ISDN transmissions.



The workstation in the therapy accommodation.

After discharge from the hospital, some patients cannot go back home directly. Due to social problems, psychological disorders, family intolerance, it is often impossible for them to find a suitable place for treatment and surveillance of this treatment. In this case they are referred to anonymous therapy accommodations : 4 persons share the same accommodation and social helps (for cleaning and cooking) are made available. This is completely anonymous and even the neighbours ignore that these people are suffering from AIDS and undergoing special treatments.

The medical surveillance is made by the GPs of the sector. This follow-up is more and more difficult because of the new 3 drugs treatments which represent a significant improvement in terms of life-expectancy. But with these new therapy methods and consequently the patients are difficult to be managed by a non specialist practitioner.

When adverse effects on observed and are not under control after the GP's intervention, then the patient is referred backwards to the University Hospital which increases the ambulance costs and may be harmful for the patient.

The co-operative workstation allowed the GP functions:

1. To have a direct access to the hospital patient record. These records are made available on the local hospital server and the GP can read it after identification and authentication. These records are anonymous and are identified by a personal Id Number.
2. To have access to the lab results from the hospital private lab, or virology lab.
3. To have relevant information about the adverse drugs effects, how to manage them, how to treat them. Elements of surveillance and treatment are regularly updated for a better, on-time information.

So, when the GP is visiting a patient in a therapy accommodation, he can have immediately the relevant information concerning the patient and new acknowledgements about his follow-up. In some cases, a direct contact can be necessary between the GP and the specialised hospital physician: the videoconferencing capabilities of the co-operative workstation make this easy and friendly-to-use.

Currently, two accommodations (2x4 beds) are equipped and the new possibilities offered by this medical network are under evaluation to assess their interest in case of chronic disorders.

CONCLUSION

With the development of Telemedicine, more effective applications of Co-operative Work in Healthcare will be available. The communication between hospitals and GP will be improved by these means to facilitate the follow-up of chronic patients. This current project of « therapy flats communication » will provide the GP with a more accurate and secure information when he takes charge of AIDS patients.

New technological advances and standardisation of transmission protocols are nevertheless necessary to generalise these concepts [5].

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